MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2017/2018

TCP2451 – PROGRAMMING LANGUAGE TRANSLATION
TCS 3311 – COMPILER DESIGN/

(All Sections / Groups)

16 October 2017
2.30 PM – 4.30 PM
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. Answer **ALL** questions.
2. This question paper has 4 printed pages excluding the front cover.
3. Please print all your answers in the answer booklet provided.

QUESTION 1

(a) Given the following tokens descriptions:

Identifier: an English alphabet (any upper or lower cases) followed by zero or more repetitions of digits.
Exit_Command: alphabet 'E' ending with a valid identifier.

Write down a regular expression for each of the two token patterns.

[5 marks]

(b) Draw a NFA to recognize the "Exit_Command" token for the regular expression in question 1(a).

[10 marks]

(c) Using subset construction method, draw a transition table for a DFA derived from the NFA in question 1(b).

[10 marks]

Continued .....

QUESTION 2

(a) For the following grammar, determine if it is:

i. Ambiguous
ii. Suitable for LL(1) parsing

$S \rightarrow S\ a\ S \mid S\ b\ S \mid c$

Your answers must come with justifications to get full marks.

[7 marks]

(b) Perform the FIRST and the FOLLOW operations on the non-terminals of the following grammar

$S \rightarrow ES'$
$S' \rightarrow \varepsilon \mid + S$
$E \rightarrow 0..9 \mid (S)$

Show all your steps to get full mark.

[9 marks]

(c) Draw LL(1) parsing table for the grammar in 2(b).

[9 marks]

Continued .....

QUESTION 3

(a) Given the production rules for a simple calculator:

<I> → <I><D> | <D>
<D> → 0 … 9
<E> → <E> + <I> | <E> - <I> | <I>

Write JLex specifications for any THREE (3) tokens that can be recognized by the scanner.

[9 marks]

(b) Study the following production rules. Provide semantic rules that will calculate the multiplication of the digits.

Minimum requirements: T' non-terminal must have an inherited attribute (that performs the actual multiplication) and T' also must have a synthesized attribute that passes up the computed value to the root. You are free to add other attributes to the non-terminals.

PRODUCTION RULES	SEMANTIC RULES
T -> FT'	
T' -> *FT'$_1$	
T' -> ε	
F -> digit	

[10 marks]

(c) Explain the difference between explicit type conversion and implicit type conversion with the help of examples.

[6 marks]

Continued .....

QUESTION 4

(a) There are THREE block structures namely monolithic, flat, and nested. Draw the structures of the THREE block structures and briefly describe them.

[9 marks]

(b) Explain the following global optimization approaches

i. Global common subexpressions
ii. Copy propagation
iii. Dead-code elimination

[9 marks]

(c) Illustrate the indirect triples three-address code approach to represent the following as intermediate code.

```
a := b * - c + b * - c
```

[7 marks]

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